Germination of *Arabidopsis thaliana* Aided by Bacterial Interaction

Bessie Abrego, Kayla Simmons, and William Omdahl
Supervised by: Dr. Kathleen Engelmann
The Department of Biology
The University of Bridgeport, Bridgeport, CT 06604

Pilot Study: A mixture of soil microbes increased the growth of the plant *A. thaliana* better than single species did alone.

Hypothesis: *Arabidopsis thaliana* specimens germinated in isolated soil bacteria will exhibit positive growth characteristics and rates.

Background: Arabidopsis thaliana is a small flowering plant in the family, Brassicaceae. The characteristic short lifecycle and other qualities make this model plant for scientific research.[1] Nitrogen is very limited in a usable form for plants in most soils. The liberation of nitrogen from the environment is essential for the plants' survival. Nitrogen fixation is done by soil micro-organisms that break apart nitrogenous compounds into simple, assimilable forms of this essential nutrient. Introduction of soil microorganisms is in agricultural to ensure an ample supply of nitrogen containing compounds to improve crop yield. Four ecotypes: Kas-1 (India), Col-0 (USA), Rsch-4 (Russia), and Bs-5 (Switzerland) were used to test the resulting growth with respect to ecotype and origin. Biomass produced from measured using Kas-1 at varying temperatures. Four ecotypes allow for genetic variation to be considered when analyzing the collected results.

Growth Method

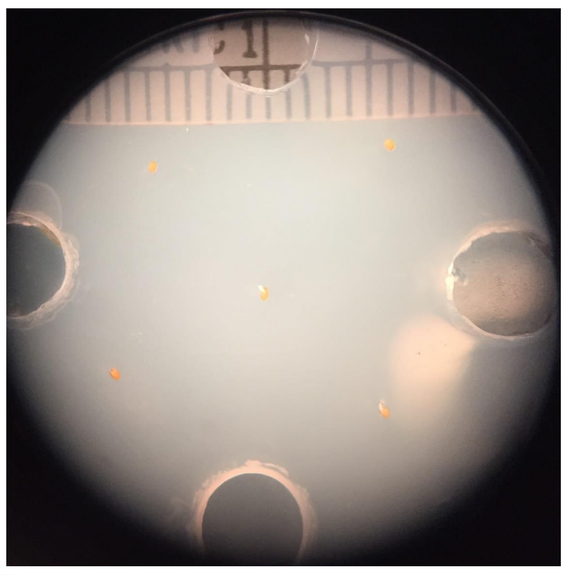
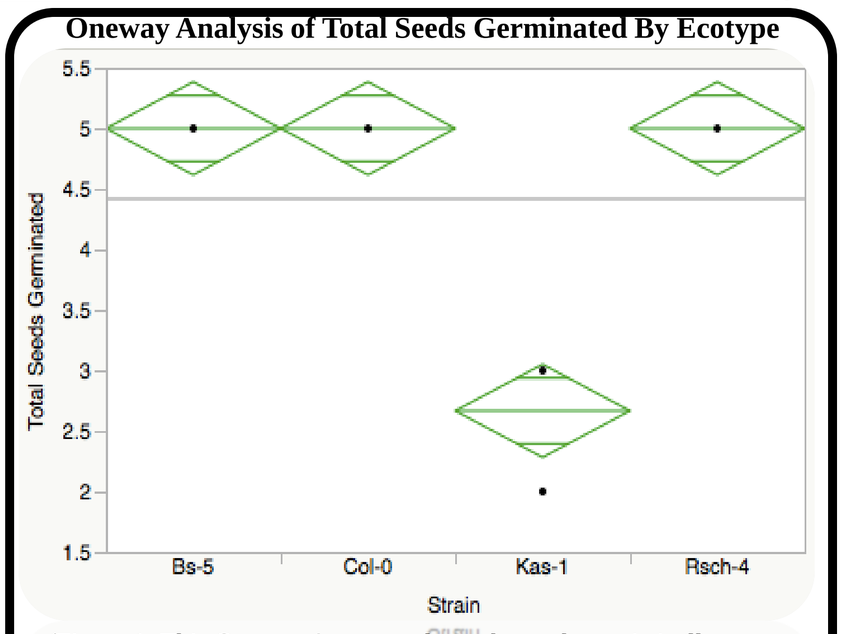


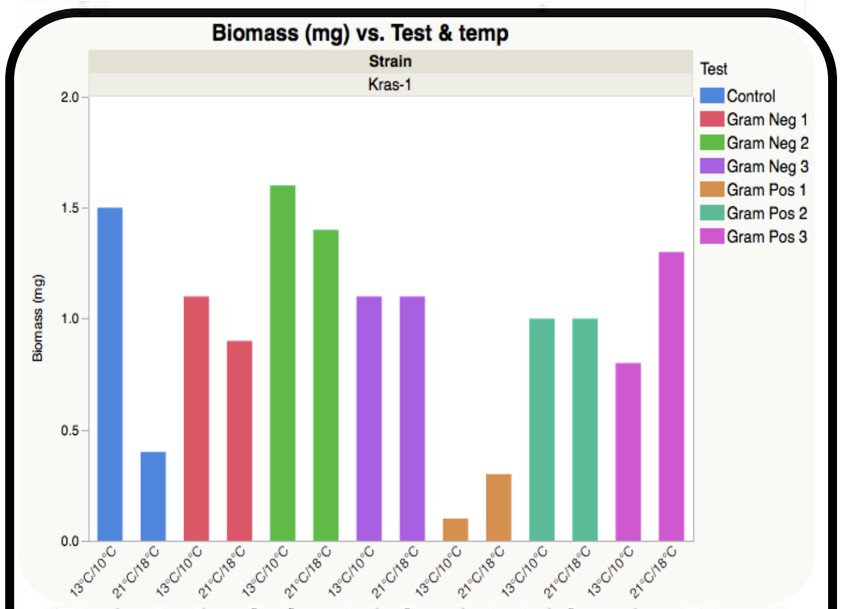
Figure showing the spacial arrangement on the plate.

Methods and Materials:

- Bacteria was isolated from soil (exception of *M. luteus*) and were categorized as Gram Positive or Gram Negative
- Petri dishes filled with Murashige Skoog enhanced agar
- (basic growth nutrients)
- Seeds washed in 10% bleach prior to stratification
- Uniform wells were stamped in
- Bacteria samples added via inoculated broth media
- Seeds placed 5 per plate equidistant from wells
- Grown in temperature/light control chambers for 14 days
- Growth was visually analyzed daily
- Resulting plant matter was removed and subjected to direct sunlight to dry for biomass recording
- Data was analyzed using JMP statistical software



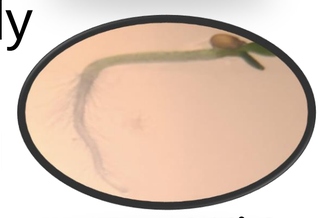
(Figure 1: This Oneway Anova analysis shows the statistically significant decreased growth rate of Kas-1.The Prob>F value for the ecotypes is <0.0001)



(Figure 2: Graph showing the variation between Biomass produced by each treatment of Kas-1 in the warm and mild growing climates. Kas-1 was used for its preferred growth temperature around 20° C.)

Results: After 14 days, the growth rate of Kas-1 grew statistically significantly slower than the other ecotypes shown by a P value less than 0.0001. After 14 days of growth, the biomass of the control plants was not statistically significantly different from the plants grown with soil microrganisms at 13° C, although the plants did appear different (Fig 2).

Kas-1, Day 14, 13/10° C



Kas-1, Day 14, 21/18° C

Conclusion: Kas-1 was found to grow significantly slower than the other tested ecotypes. Although the result for biomass were not statistically significant, we did observe differing trends in the pattern of growth of Arabidopsis in the presence of different soil organisms. For future studies, we are interested in stratifying seeds in the presence of microorganisms to see if there is an effect of soil microcommunities at the earliest stages of growth.

Resources:
[1]"TAIR - About Arabidopsis." *TAIR - About Arabidopsis*. N.p., 1998. Web. 12 Feb. 2015.
[2]JMP®, Version *10*. SAS Institute Inc., Cary, NC, 1989-2007.